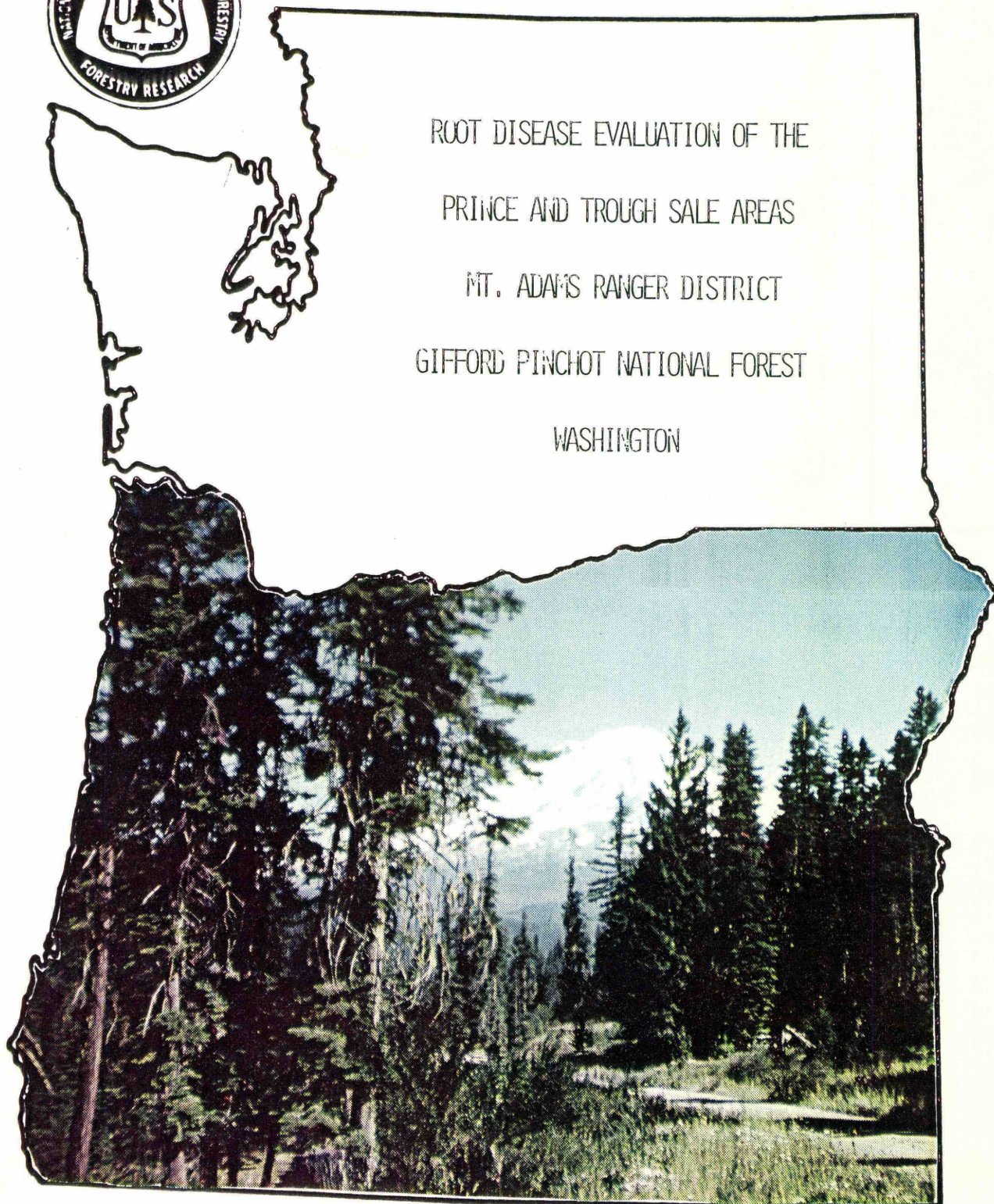


SPR1
6004

Forest Pest Management *Pacific Northwest Region*



ROOT DISEASE EVALUATION OF THE
PRINCE AND TROUGH SALE AREAS
MT. ADAMS RANGER DISTRICT
GIFFORD PINCHOT NATIONAL FOREST
WASHINGTON



ROOT DISEASE EVALUATION OF THE PRINCE AND
TROUGH SALE AREAS, MT. ADAMS RANGER
DISTRICT, GIFFORD PINCHOT NATIONAL FOREST
WASHINGTON

by

Gregory M. Filip

Appreciation is extended to P. Cagney and A. Kanaskie for assistance in the field work and to D. Goheen and S. Cooley for manuscript review.

Summary

Two active timber sale areas were surveyed to measure percent infection by root diseases using a modified line-intercept method. Approximately 5.1% and 3.6% of the areas were found to be affected with large (10-25 acre) centers of *Phellinus weirii* and small (1-5 tree) centers of *Armillaria mellea*. Favoring or planting pine or larch in marked root-diseased areas is recommended for reducing future losses.

Introduction

On August 5, 1981 pathologists from the Regional Office made a cursory examination for root diseases in two active timber sale areas at the request of Mt. Adams District personnel (Fig. 1). Following the examination, it was recommended that both sale areas be examined systematically to locate and mark all large root disease centers.

Objectives

1. Locate and mark all large (5 acre +) root disease centers in both sale areas.
2. Determine percent of stand infected by root diseases using a line-intercept survey.
3. Formulate treatment recommendations based on the survey data.

Methods

A line-intercept survey as modified from Bloomberg et al (1980) was used to determine percent of the stand infected by root diseases. Transects were established at 10-chain intervals across each stand. A model M-25 hip-chain was used to measure line lengths and position of infected areas. The proportion of total line length that fell within infected areas was determined. Infected areas were determined (1) on an individual tree basis by estimating the rooting zone of an infected tree based on its DBH or (2) in large, diseased areas by noting the beginning (first symptomatic trees) and ending (last symptomatic trees) of the infection center along the transect.

Each infected area was examined for root pathogens. Dead or symptomatic trees were examined by removing soil from root collars and at least two major roots and checking bark surfaces for ectotrophic mycelia of *Phellinus weirii* (cause of laminated root rot) and the bark-wood interface for mycelial fans of *Armillaria mellea* (cause of Armillaria root rot).

All large (5 acres or greater) root disease centers were marked by placing red or orange flagging fifty feet beyond symptomatic trees to include hidden infection.

A map of each sale area was constructed showing location of transects and all marked root disease centers.

Results

Both timber sale areas were being harvested selectively to remove 30-40% of the basal area at or near the time of our survey. The remaining stands in both sales were composed primarily of grand fir, ponderosa pine, and Douglas-fir. Some western larch and white pine were observed.

Twenty-six transects totaling 35,063 yards (19.9 miles) were followed across the two sale areas. The units contained approximately 650 and 1,000 acres, respectively (Fig. 2). Approximately 5.1% of the Prince Sale and 3.6% of the Trough Sale were found to be infected with root diseases (Tables 1 and 2). Most of the twenty-four infection centers encountered were small (1-5 trees) and caused by *Armillaria mellea* in either ponderosa pine or grand fir. They were left unflagged. One large (25 acre) disease center caused by *Phellinus weirii* was marked in the Prince Sale (Fig. 2). Two large centers (10 and 12 acres) caused by *P. weirii* were marked in the Trough Sale. The stands in both sale areas were open sufficiently to allow detection of all major root disease centers between transects. The survey was completed in 6 days with a crew of two.

Discussion

In a survey done in October 1980 of an adjacent sale area, laminated root rot was found causing damage in relatively discrete infection centers in grand fir and Douglas-fir (Filip 1980). Contrarily, Armillaria root rot was found scattered throughout the sale area, causing damage primarily in individual trees, usually weakened through suppression or by other pests. This pattern for the two root diseases also appears in both the Trough and Prince Sales.

Laminated root rot is probably the most damaging root disease in the Pacific Northwest. It is especially devastating to Douglas-fir and grand fir which are rated as highly susceptible to the disease (Hadfield and Johnson 1977). The fungus remains on the site long after infected trees are harvested, residing in the infected stumps. Susceptible regeneration or plantings that contact infected stumps are in turn infected and generally die. The site may remain infected indefinitely. On such sites, western larch may become infected and die but at a lower rate than Douglas or grand fir.

The pines, including white, ponderosa, and lodgepole, are classified as being much more resistant than the firs or larch, rarely becoming infected and dying.

Armillaria root rot plays a "Jekyll and Hyde" role: sometimes appearing as an opportunist killing already weakened trees; other times becoming aggressive, killing apparently healthy, vigorous trees to form massive infection centers as in ponderosa pine on St. Regis Paper Company land about 5 miles southeast of the Prince Sale (Shaw et al 1976). In the Prince and Trough Sale, Armillaria root rot appears as the opportunist, killing scattered, individual trees apparently weakened by other factors. We feel that Armillaria root rot will not become aggressive if portions of the surveyed stands are converted to pine, provided local planting stock is used and the plantations are well managed.

Recommendations

The District has elected to treat all marked root diseased areas in both sale areas. We offer the following recommendations:

- (1) Remove or destroy grand fir and Douglas-fir seed trees that are adjacent to the marked areas to reduce regeneration of these species within the marked area.

- (2) Remove or destroy all grand fir and Douglas-fir, including all unmerchantable material from within the marked areas. Use machinery with brush blades to destroy and uproot as much unharvested fir as possible. Root systems need only be exposed to the air to kill root pathogens. Light soil disturbance will also create good seed beds for disease-tolerant larch and pines.

- (3) Retain as much larch and especially pine as possible in the overstory to act as seed trees and in the understory to serve as potential crop trees.

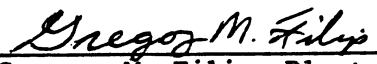
- (4) Plant larch or pine in areas without adequate stocking of these species.

The information and recommendations presented in this report have been specifically formulated for the area we surveyed. Although some of this information may be applied to other areas in Oregon and Washington experiencing similar root disease problems, these areas may be sufficiently different from the area we surveyed to warrant a separate biological evaluation to formulate management alternatives specific to that area. FPM pathologists encourage and are available to perform such evaluations at the request of land managers.

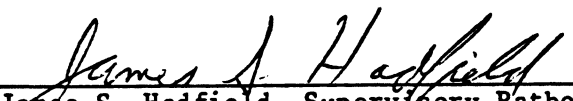
References

- Bloomberg, W. J., P. M. Cumberbirch, and G. W. Wallis
1980. A ground survey method for estimating loss caused by *Phellinus weirii* root rot. II. Survey procedures and data analysis. Can. For. Serv., Pac. For. Res. Ctr., Victoria, B.C. BC-R-4, 44 p.
- Filip, G. M.
1980. Disease survey of Smith Butte in the Plough Sale Area, Mt. Adams Ranger District, Gifford Pinchot National Forest, Washington, Forest Pest Management, Pacific Northwest Region, USDA Forest Service, Portland, Oregon. 14 p.
- Hadfield, J. S. and D. W. Johnson
1977. Laminated root rot--a guide for reducing and preventing losses in Oregon and Washington forests. Forest Pest Management, Pacific Northwest Region, USDA Forest Service, Portland, Oregon. 16 p.
- Shaw, C. G. III, L. F. Roth, L. Rolph, and J. Hunt
1976. Dynamics of pine and pathogen as they relate to damage in a forest attacked by *Armillaria*. Plant Dis. Rep. 60: 214-218.

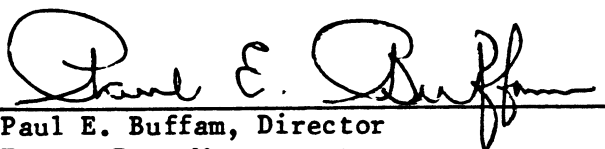
Prepared by:


Gregory M. Filip, Plant Pathologist
Forest Pest Management
State and Private Forestry

Reviewed by:


James S. Hadfield, Supervisory Pathologist
Forest Pest Management
State and Private Forestry

Approved by:


Paul E. Buffam, Director
Forest Pest Management
State and Private Forestry

GIFFORD PINCHOT NATIONAL FOREST

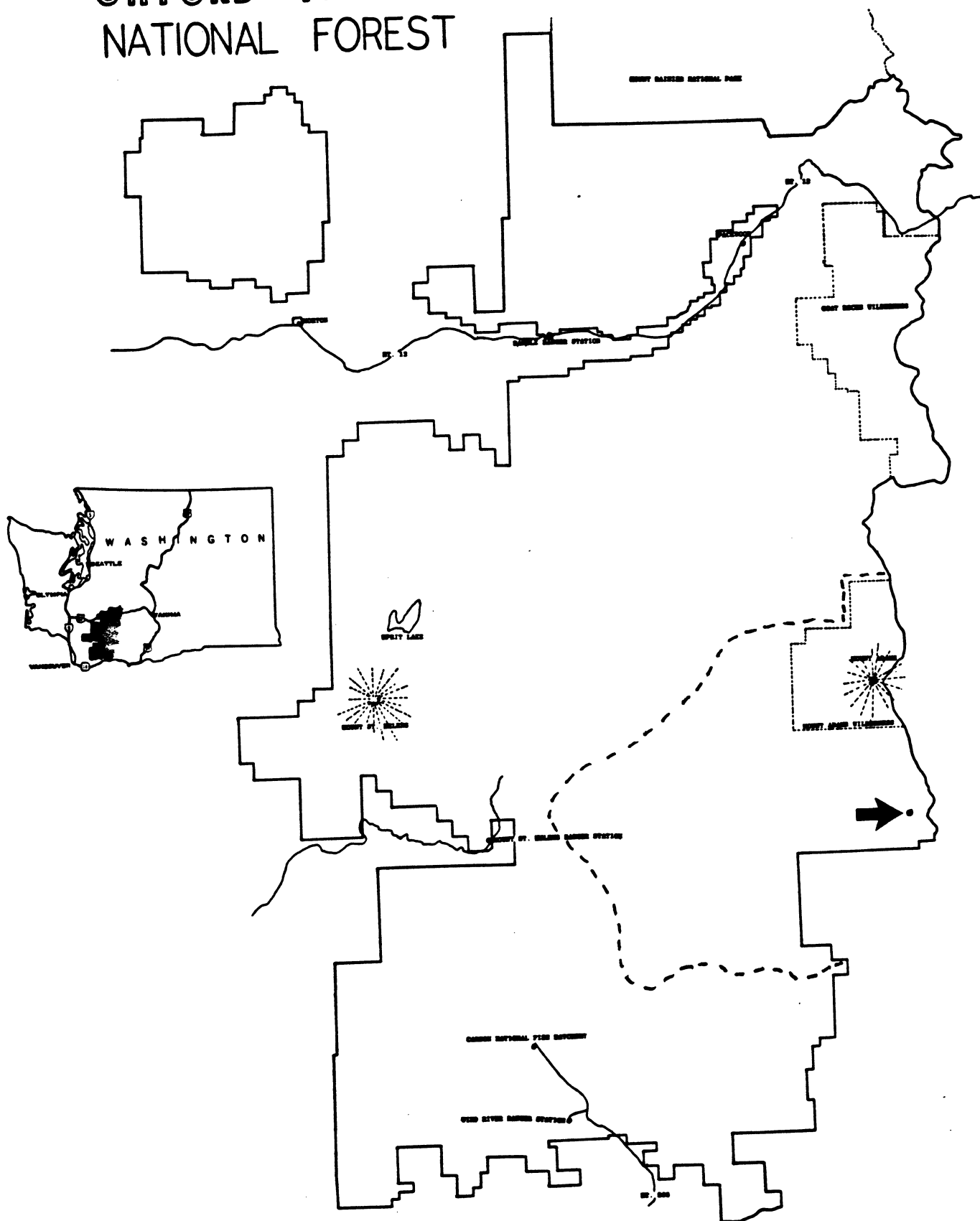


Figure 1. Map depicting location (arrow) of Prince and Trough Sale Areas. Dotted line indicates northern, western, and southern boundaries of the Mt. Adams Ranger District.

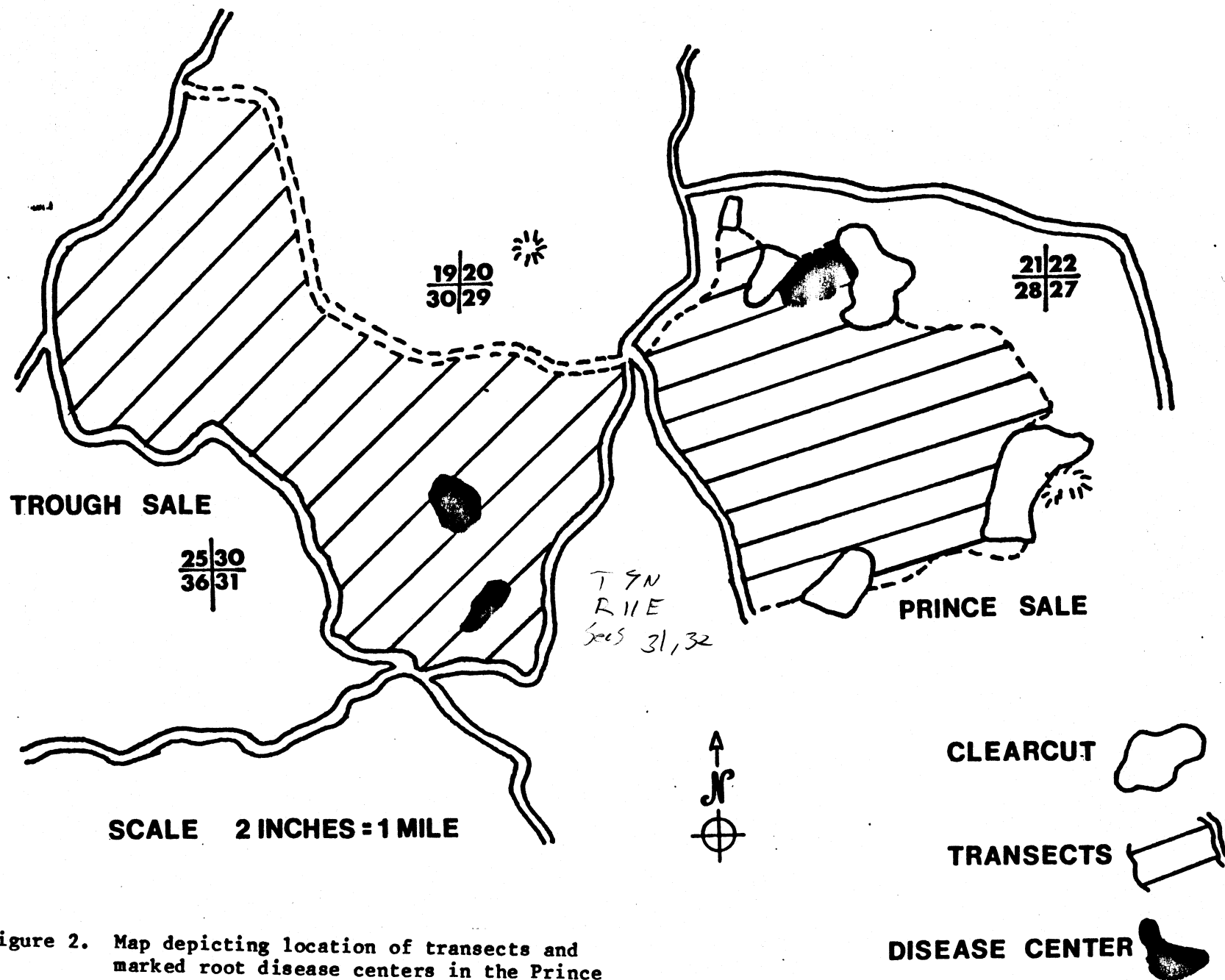


Figure 2. Map depicting location of transects and marked root disease centers in the Prince and Trough Sale Areas.

SECTION NUMBERS $\frac{6}{7} \mid \frac{5}{8}$

Table 1--Percent of stand infected by root diseases as determined by line-intercept survey in the Prince Timber Sale, Trout Lake, Washington

Line No.	Total Length (Yds)	Infected Length (Yds)		
		<i>Armillaria</i>	<i>Phellinus</i>	Total
1	1,063	0	0	0
2	1,260	0	0	0
3	1,490	12	0	12
4	447	0	0	0
5	1,913	0	0	0
6	1,568	0	0	0
7	1,236	0	0	0
8	1,396	8	0	8
9	1,473	12	598	610
10	340	0	0	0
11	150	0	0	0
Total	12,336	32	598	630
Percent		0.3	4.8	5.1

Table 2—Percent of stand infected by root diseases as determined by line-intercept survey in the Trough Timber Sale, Trout Lake, Washington.

Line No.	Total Length (Yds)	Infected Length (Yds)		
		<i>Armillaria</i>	<i>Phellinus</i>	Total
1	468	9	0	9
2	773	33	245	278
3	2,187	0	88	88
4	2,305	0	273	273
5	1,894	23	83	106
6	1,600	0	0	0
7	898	0	0	0
8	878	0	0	0
9	684	30	0	30
10	1,272	0	0	0
11	1,515	0	0	0
12	1,902	0	0	0
13	2,582	2	0	2
14	2,026	31	0	31
15	1,743	9	0	9
Total	22,727	137	689	826
Percent		0.6	3.0	3.6